Transports and propagation of anomalies in the Norwegian and Barents Seas

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Extended abstract

(Full article: Skagseth, Ø., Furevik, T., Ingvaldsen, R., Loeng, H., Mork, K.A., Orvik, K.A., Ozhigin, V. (2008) Volume and heat transports to the Arctic via the Norwegian and Barents Seas. In Arctic-Subarctic Ocean Fluxes: Defining the role of the Northern Seas in Climate. Eds. R. Dickson, J. Meincke and P. Rhines, Springer Verlag.)

The main aim of this paper has been to present a holistic view of the Atlantic water flow along the Norwegian Coast and into the Barents Sea. It has focused on the period starting in the mid-1990s, with simultaneous arrays of moored current meters in the Svinøy section and the Barents Sea Opening. These detailed measurements have provided the bases for improved estimates of means and variations in fluxes, and their forcing mechanisms (Skagseth, 2008).
Mean volume and heat fluxes associated with the Atlantic water are 4.3 Sv and 126 TW respectively for the Svinøy section, showing no significant trends, and 1.8 Sv and 48 TW for the Barents Sea Opening, where positive trends have been found in both measures. The transport series show a prominent, but irregular, seasonal cycle at both sites, mainly determined by variations in the volume flux. The inter-annual changes are both substantial, but are relatively larger in the Barents Sea Opening.

In terms of prediction the data confirm the approximately two-year lag in anomalies from the Svinøy section to the Barents Sea Opening. This strongly suggests that the recent relative cooling of the Svinøy section will be seen in the Barents Sea Opening in the next few years. However, as the volume flux becomes relatively more important in determining the climate in the eastern part of the Barents Sea, this region is probably less predictable, since atmospheric forcing is basically unpredictable beyond time-scales of one week.

Hydrographic data along the Norwegian Coast show that the periods of direct current measurements, after 1995 for the Svinøy section and 1997 for the Barents Sea Opening, are the prolongations of a period that started in the late 1970s, since when Atlantic water has become warmer and saltier. This means that, given the assumption of constant volume fluxes, the estimated heat fluxes are higher than the long-term mean.
The close resemblance, throughout the record, between temperature variations in the Kola section and the AMO-index back to the early 20th century illustrates the importance of large-scale long-term variations in the Barents Sea system. Although the magnitudes of these variations are relatively small in comparison with inter-annual variations, other studies have shown them to be of major importance for ecosystem changes (ACIA, 2005).

Forcing mechanisms, relating primarily to the wind, of the NwASC and the Atlantic water flow into the Barents Sea, were reviewed. The different forcing effects of the NwASC and the Atlantic inflow to the Barents Sea to similar atmospheric systems are noted. The results strongly suggest that the relative distribution of the NwAC entering the Barents Sea and passing through the Fram Strait is very sensitive to storm tracks. Thus, in a climate change perspective, changes in the predominant storm tracks may trigger major changes, including feedback mechanisms, for the Barents Sea climate and the heat budget of the Arctic Ocean.